MYCOTAXON

Volume 107, pp. 201–208 *January–March 2009*

Craterellus excelsus sp. nov. from Guyana

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Abstract — *Craterellus excelsus* (*Cantharellaceae, Cantharellales, Basidiomycota*) is described from the Pakaraima Mountains of Guyana, where it occurs in rain forests dominated by ectomycorrhizal *Dicymbe* spp. (*Caesalpiniaceae*). *Craterellus excelsus* is noteworthy for its tall (up to 150 mm), persistent, abundant basidiomata that develop in large caespitose clusters. Macromorphological, micromorphological, and habitat data are provided for the new species.

Keywords — monodominant forest, tropical fungi, taxonomy, Guiana Shield

Introduction

In the primary rain forests of Guyana's Pakaraima Mountains, species of *Craterellus* and *Cantharellus* (*Cantharellaceae*, *Cantharellales*, *Basidiomycota*) are conspicuous components of the macromycota associated with ectomycorrhizal (EM) canopy trees of the genus *Dicymbe* (*Caesalpiniaceae*, tribe *Amherstieae*) (Henkel et al. 2002, 2004). Taxa from the *Cantharellales* occurring in these forests include *Cantharellus guyanensis*, *C. atratus*, *C. pleurotoides*, three undescribed species of *Craterellus*, and >15 *Clavulina* species, a number of which remain undescribed (Thacker & Henkel 2004, Henkel et al. 2005, 2006). Here we describe *Craterellus excelsus* as a distinct new species based on its grey-brown, persistent basidiomata that are regularly >100 mm tall and occur in large caespitose clusters, and its long basidia of variable lengths (75–101 μm) with varying numbers of sterigmata (2–6).

Materials and methods

Collections were made during the May–July rainy seasons of 2000–2004 from the Upper Potaro River Basin, within a 5 km radius of a permanent base camp

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at 5° 18' 04.8" N; 59° 54' 40.4" W; elevation 710 m. This collecting site is located in an undulating valley approximately 20 km east of Mt. Ayanganna (2200 m), and is densely forested with a mosaic of primary *Dicymbe*-dominated and mixed forests of the *Eschweilera-Licania* association (Henkel 2003). An additional collection was made from the Upper Ireng River Basin, ~30 km south of the Potaro site, in May 1998. All collections were made in forests dominated by *Dicymbe corymbosa*. Macromorphological features were described fresh in the field. Colors were described subjectively and coded according to Kornerup & Wanscher (1978), with color plates noted in parentheses. Abbreviations used in the species description indicate page number, the column, and the row; for example 8D-F5-6 indicates page 8, columns D to F, and from rows 5 to 6. Macrochemical tests were performed according to the methods of Singer (1986). Fungi were field-dried with silica gel.

Micromorphological features of fresh specimens were examined in the field with a battery-powered EPOI microscope with light optics, and those of dried specimens were examined in the laboratory with an Olympus BX51 microscope with bright field and phase contrast optics. At least 20 individual structures were measured for basidiospores, basidia, and tramal hyphae (for basidiospores, mean Q = the mean of basidiospore length/width ± standard deviation). Rehydrated fungal tissue was mounted in H_2O, 3% KOH, and Melzer's solution. Terminology for hyphal tissue construction follows that of Corner (1966). Line drawings were made from digital photographs. Specimens were deposited in the following herbaria: BRG – University of Guyana; HSU – Humboldt State University; and LSU – Louisiana State University (Holmgren et al. 1990).

Taxonomic description

Craterellus excelsus T.W. Henkel & Aime, **sp. nov.** FIGS 1–2

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Habitus carpophori infundibuliformis fasciculato-caespitosus. Basidiomata fusca (5C4-5C5-5D4), 60–135(–150) × 7–17 mm, sterili basi incana. Basidiosporae (7)9–12 × 6.5–9 µm, subglobosae, laeves. Basidia (65–)75–101 µm longa, 2–6 sterigmatibus. Cystidia nulla. Fibulae nullae. Craterellus orinocensis similis C. excelsi basidiomae forma et basidiosporae magnitudine, sed colore fuliginoso, hymenio rugoso-striato, et basidio breviore, semper 6-sterigmatibus differt.

HOLOTYPE: *Henkel 8235* (BRG; ISOTYPES: HSU, NY)

ETYMOLOGY. *Excelsus*, Latin, "lofty, high", referring to the tall basidiomata.

KEY CHARACTERS — *Craterellus excelsus* is easily recognized in the field by its large, persistent, infundibuliform grey-brown basidiomata in caespitose clusters forming abundantly during the rainy season under *D. corymbosa*. The species is distinguished microscopically by its basidia, which are long and variable in length (75–101 µm) and have varying numbers of sterigmata (2–6).

FIG. 1. Basidiomata of *Craterellus excelsus*. a. BRG HOLOTYPE Henkel 8235. Bar = 10 mm. b. Fruiting habit, Upper Potaro Basin, Guyana.

Craterellus excelsus is likely ectomycorrhizal as it has been collected only in stands dominated by EM *D. corymbosa*.

Macrocharacters — basidiomata in caespitose clusters 75–150 × 32–95(–130) mm. Individual mature basidiomata 60–135(–150) mm × 7–17 mm centrally, attenuating slightly at extreme base; apex 25–70 mm broad; smallest primordia filiform acuminate, expanding first to elongate-infundibuliform, entirely perforate, expanding further to broadly infundibuliform at maturity; inner surface light grey-brown (5C4-5C5-5D4) throughout, glabrous, hispid under hand lens; outer surface broadly and irregularly rugose, especially near base; moist; subcoriaceous; margin straight in the primordial stage, slightly outcurved during early expansion, at maturity expanding further to form larger, broadly wavy lobes, these splitting lengthwise with increased age; hymenium developing and thickening over entire outer surface though irregularly over lower half with extreme base sterile, glabrous, minutely hispid under lens, light cream grey (5B2) when young, concolorous to light grey (4B1-4B2) with age, drying tan-orange (5A4-5A5); context thin, firm and pliant; odor fragrant and fruity; taste sharp, tangy; spore deposit not obtained; edibility: edible and choice when cooked.

Microcharacters — basidiospores (7–)9–12 × 6.5–9 µm (mean Q = 1.4 ± 0.2, range = 1.1–1.8, n = 25), subglobose, smooth, inamyloid; wall hyaline; contents uniguttulate, minutely and evenly granulose, pale golden in H_20 and KOH; hilar appendix 0.6–1.2 µm long. basidia (65–)75–101 µm long, width at apex 7.4–9.3(–9.9) µm, at middle 6.8–9.3(–9.8) µm, at base (4.3–)4.9–6.8(–7.4) µm, subcylindric, tapering toward base over lower half; pre-partal basidia with opaque, minutely granulose contents, pale golden in H_20 and KOH, post-partal basidia devoid of contents and hyaline; sterigmata 4.9–8(–8.6) × 1.8–3.1 µm wide at base, cornute, (2–)3–4(–5,6) per basidium; basidioles numerous, from branched clusters, intermixed with mature basidia, pale golden in H_20 and KOH; hymenium 64–94(–124) µm thick; cystidia none; subhymenium undifferentiated; tramal hyphae branching frequently, hyaline in KOH, mostly isodiametric, some inflated; cells (69–)80–160 × (4.9–)6.8–9.9(–11.7) µm, slightly constricted at septa, lacking secondary septations; wall 0.6–1.2 µm wide; clamp connections none; medulla 900–1100 µm thick, composed of longitudinal but sinuous and tightly interwoven tramal hyphae; sterile cortex of inner surface 70–142 µm thick, scarcely differentiated from medulla, of loosely interwoven, irregularly anticlinal tramal hyphae; hyphae of sterile base undifferentiated from apical trama; secondary septations none.

Macrochemical reactions — KOH and NH_4OH nil on inner surface and hymenium.

Ecology, range, distribution — Scattered and frequent in caespitose clusters on soil and humus under *Dicymbe corymbosa* on various soil types. Fruiting prolifically during the May–July rainy season; basidiomata developing

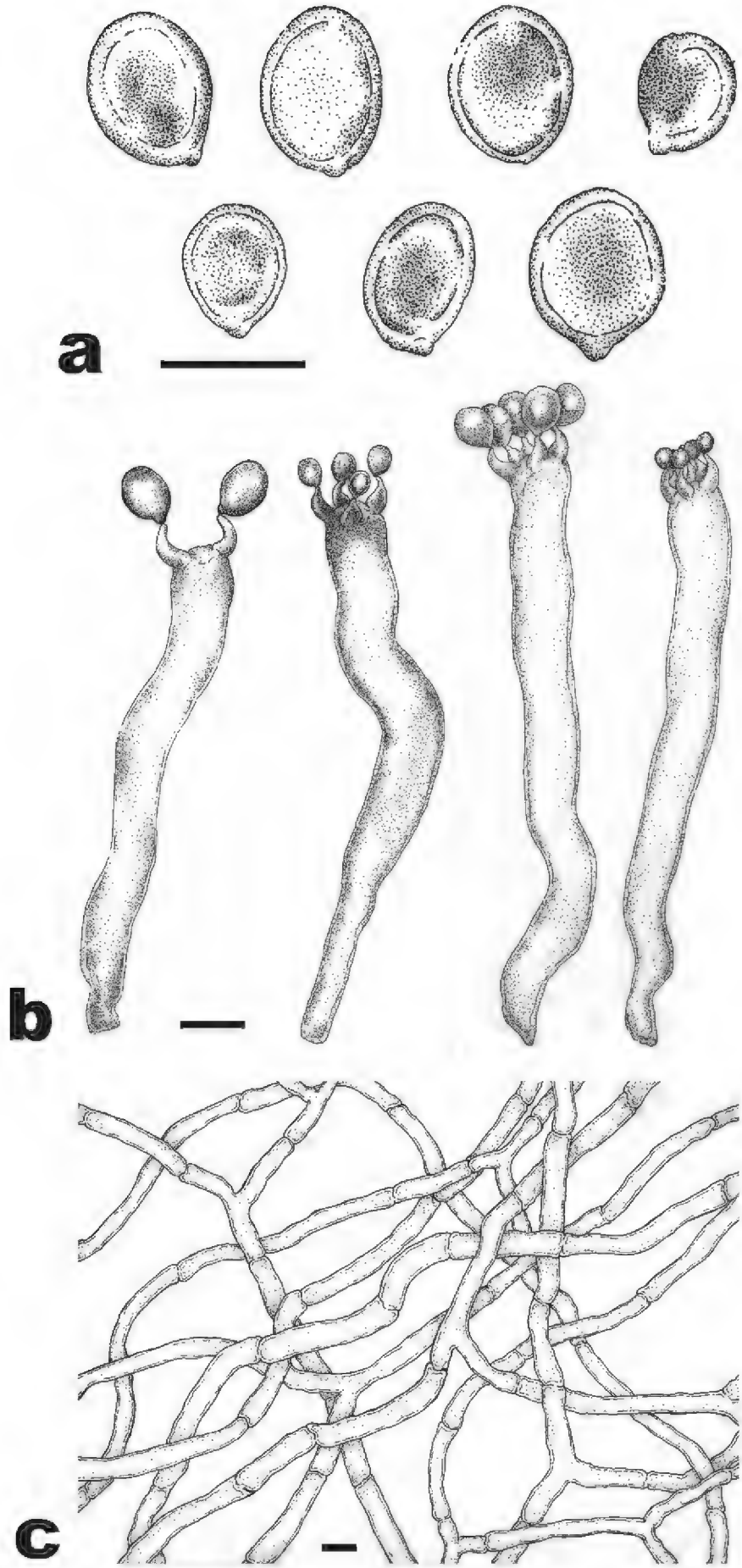

FIG. 2. Microscopic features of *Craterellus excelsus* (BRG HOLOTYPE Henkel 8235). a. Basidiospores. b. Basidia with immature basidiospores. c. Tramal hyphae. Bars = 10 µm.

and persistent in the field over several weeks, with little sign of decay. Known from the type locality in the Upper Potaro River Basin and adjacent Ireng River Basin of Guyana.

Representative specimens examined. **GUYANA.** Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Ireng River Basin, west slope of Kukuinang Mt., two km east of confluence of Sukabi and Ireng Rivers, elevation 1000 m, May 23, 1998, *Henkel* 6556 (BRG; HSU). Upper Potaro River Basin, ~ 20 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5° 18′ 04.8″ N, 59° 54′ 40.4″ W, elevation 710–750 m: at Potaro base camp, 26 May 2000, *Henkel 7432* (BRG, HSU); vicinity of base camp, 23 June 2000, *Henkel* 7550 (BRG, HSU); at base camp, 18 June 2000, *Henkel 7515* (BRG; HSU); 3 km SW of base camp located at 5° 18′ 04.8″ N, 59° 54′ 40.4″ W, elevation 710 m, in *Dicymbe* plot 3, 2 June 2001, *Henkel 8235* (HOLOTYPE, BRG; ISOTYPE: HSU, NY);1 km southwest of base camp on trail to *Dicymbe* plot 3, 27 June 2006, *Aime 3107* (BRG; LSU).

Comments — On the basis of its infundibuliform, perforate, subcoriaceous basidiomata arising from acuminate primordia with straight margins *C. excelsus* can be identified as a species in *Craterellus* in both the traditional and modern senses (Corner 1966, Feibelman et al. 1997, Dahlman et al. 2000, Henkel et al. 2006, Moncalvo et al. 2006). This identification is corroborated by the smooth, thickening hymenium, the long, narrow basidia bearing 2–6 curved sterigmata, the white, smooth, thin-walled, inamyloid basidiospores, and monomitic tramal hyphae lacking clamp connections and secondary septations (Corner 1966).

Because of its broadly undulate to crenate, lobed basidioma margin and similarly-sized basidiospores *C. excelsus* resembles the Venezuelan *C. orinocensis*. However, *C. orinocensis* can be distinguished from *C. excelsus* by its brownish fuliginous, shorter basidiomata (≤ 80 mm) with rugose-striate hymenia and shorter (55–60 µm), consistently 6-sterigmate basidia (Corner 1966, Singer et al. 1983).

Craterellus verrucosus from Malaysia has the caespitose habit, a light grey hymenium, a thin, pliant context, and basidiospores similar in size to those of *C. excelsus*. *Craterellus verrucosus* can be distinguished from *C. excelsus* by its fuscous fuliginous to black basal stem, shorter basidiomata (30–70 mm), shorter, subclavate basidia (55–95 µm), and more inflated tramal hyphae (up to 25 µm wide) (Corner 1966).

The north temperate *Craterellus cornucopioides* var. *cornucopioides* is phenetically similar to *C. excelsus* with caespitose basidiomata occasionally reaching 150 mm in height and basidia approaching 100 µm in length, but can be distinguished by its regularly bisterigmate basidia and fuliginous black basidiomata with cinereous hymenia (Corner 1966). The European *C. cornucopioides* var. *flavicans* and *C. cornucopioides* var. *roseus* are distinguished by light yellow or rosaceous hymenia, respectively. In the tropics *C. cornucopioides* var. *mediosporus* from Malaysia has 4–6 sterigmate basidia and basidiospores similar in size to those found in *C. excelsus*, but is distinguished

by its fuliginous black basidiomata (Corner 1966). *Craterellus cornucopioides* var. *parvisporus* from the Congo has smaller spores (6.8–8.5 × 4.3–6 µm) than *C. excelsus*, regularly 4-sterigmate basidia, and blackish brown basidiomata (Heinemann 1959).

Pseudocraterellus sinuosus, which is superficially similar to *C. excelsus* in basidioma stature and coloration and has been recorded from the Guiana Shield region (Corner 1969), is easily distinguished by its copiously secondarily septate hyphae forming moniliform rows of cells in the trama (Corner 1966).

Craterellus excelsus is an excellent edible fungus, but traditionally it was not used by the Patamona Amerindians of the Pakaraima Mountains (Henkel et al. 2004). Confirmation of its edibility by visiting mycologists has led to recent incorporation of *C. excelsus* into the assemblage of nearly 20 species of macrofungi regularly gathered and consumed by the Patamona (T.H., pers. obs.).

Acknowledgments

This research was supported by grants to TWH from the National Geographic Society's Committee for Research and Exploration, the Smithsonian Institution's Biological Diversity of the Guiana Shield Program, the Linnaean Society of London, and the Humboldt State University Foundation. The authors wish to thank Christian Feuillet for the Latin diagnosis. Field assistance in Guyana was provided by Mimi Chin, Christopher Andrew, Leonard Williams, Valentino Joseph, Francino Edmond, and Luciano Edmond. Research permits were granted by the Guyana Environmental Protection Agency. David Largent and Ronald Petersen provided valuable critical reviews of the manuscript. This paper is number 126 in the Smithsonian Institution's Biological Diversity of the Guiana Shield Program publication series.

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